

# STUDIES ON THE FAUNA OF TRICHOPTERA (INSECTA) OF KOREA.

## II. FAMILY LEPTOCERIDAE

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Very little was known about the leptocerids from the peninsula of Korea so far. First T s u d a (1942a) published three species from that family, two of them described as new. The same data have been repeated almost simultaneously by the same author (T s u d a, 1942b). Next publication containing information on Korean leptocerids (B o t o s a n e a n u, 1970) has appeared nearly 30 years later. Six species (two of them new to the science) were added there to the short list. Further on, information on several caddisfly taxa (including leptocerids) collected in Southern Korea has been given by K i m (1974); based on immature stages (not definitively determined in most of the cases), this paper is of a lesser systematical importance. Finally, M e y (1989) mentions three species, two of them new to Korean fauna. Generalizing the available literature data, 10 species from 4 genera of Leptoceridae have been known from Korea so far. These figures most probably do not exceed 25% of the real quantity of species occurring in that region.

Long-horned caddisflies are well represented in the collections of Trichoptera I am recently investigating\*. Eight genera with 26 species have been established there, of them 5 species and one subspecies are being described below as new. Thus, the list of Korean Leptoceridae now known includes at least 28 species, belonging to 9 genera and two subfamilies, respectively. All species but one — *Tripletides* sp. (K i m, 1974) — are from the subfamily of Leptocerinae.

### LIST OF LOCALITIES\*\*

#### Province Hwanghaenam-do

Loc. 1 a: Hedžu, 6. VI. 1987 (leg. Josifov, Beron & Hubenov, at light).

#### Province Kesongsi

Loc. 8 a: Kesong, inner city, 7. VI. 1970 (leg. Mahunka & Steinmann, at light).

Loc. 8 b: same place, 25. VIII. 1982 (leg. Beron & Popov, at light).

#### Province Kangvön

Loc. 9 a: Kumgang Mts., the foothills, near the hotel Go-song and Ondžöng village (ca. 50 m alt.). Stony stream, the hyporhithral-epipotamal zone. 2-3. X. 1978 (leg. Kumanski, mostly at light).

Loc. 9 c: same place, 18-20. VIII. 1982 (leg. Beron & Popov, at light).

Loc. 9 f: same region, 100-900 m alt., 4. VI. 1987 (leg. Josifov, Beron & Hubenov).

Loc. 10: Stream and small torrents in the plain near Časan village, 1-3 km from the sea (ca. 25 km E of Vönsan), 6. X. 1978 (leg. Kumanski)

\* Detailed information concerning the component collections is available in the first part of these studies (K u m a n s k i, 1990).

\*\* Only those sites where leptocerids have been collected are listed here. Their numerations follows the general one, given in the first part (K u m a n s k i, 1990), with following most recent localities added: 18 i, 18 k, 29 d and 29 e.

- Loc. 15: Si Zung-ho, woods on coastal dunes, 28. V. 1970 (leg. Mahunka & Steinmann).  
 Loc. 16 a: Lake Sam-ilp-ho, the sea level, 25. V. 1975 (leg. Josifov).  
 Loc. 16 b: same lake, 1. VI. 1970 (leg. Mahunka & Steinmann).  
 Province P h y ō n g y a n g - s i  
 Loc. 17 b: Phyŏngyang, park Moran, 17. VIII. 1982 (leg. Beron & Popov).  
 Loc. 18 a: Phyŏngyang city, river Tedong, 28-29. IX. 1978 (leg. Kumanski, at hotel's lights).  
 Loc. 18 b: same place, 29. V. 1975 (leg. Josifov).  
 Loc. 18 c: same place, 3. VIII. 1977 (leg. Josifov).  
 Loc. 18 d: same place, 12. VIII. 1974 (leg. Josifov).  
 Loc. 18 e: same place, 9. VI. 1987 (leg. Beron).  
 Loc. 18 f: same place, 5-17. VIII. 1971 (leg. Papp & Horvatovich).  
 Loc. 18 h: same place, 15. VIII. 1982 (leg. Beron & Popov).  
 Loc. 18 i: same place, 26. VIII. 1989 (leg. Josifov & Hubenov).  
 Loc. 18 k: same place, 8. IX — 3. X. 1989 (leg. Josifov & Hubenov).  
 Loc. 19 a: Phyŏngyang, park Tesong, 5-27. VIII. 1977 (leg. Josifov).  
 Loc. 19 c: same place, 21. V. 1970 (leg. Mahunka & Steinmann).  
 Province P y ō n g a n n a - m - d o  
 Loc. 20 a: Bong-ha village, the banks of river Tedong (ca. 45 km E of Phyŏngyang), 23. V. 1970 (leg. Mahunka & Steinmann).  
 Loc. 20 b: same place, 16—17. VIII. 1971 (leg. Papp & Horvatovich).  
 Loc. 26: Rjongak-san, 30. V. 1975 (leg. Josifov).  
 Loc. 27: "Thesong bei Kijang, 31. V. 1975" (leg. Josifov).  
 Province P y ō n g a n b u k - d o  
 Loc. 29 a: Myohyang Mts., the foothills (ca. 200 m alt.), 22. V. 1987 (leg. Josifov, Beron & Hubenov, at light).  
 Loc. 29 b: same place, 8-12. VI. 1987 (leg. Josifov, Beron & Hubenov, at light).  
 Loc. 29 c: same place, 14-18. VIII. 1982 (leg. Beron & Popov, at light).  
 Loc. 29 d: same place, 29. VIII. 1989 (leg. Josifov & Hubenov, at light).  
 Loc. 29 e: same place, 3-4. VII. 1990 (leg. Josifov & Hubenov, at light).  
 Province R j a n g a n  
 Loc. 32: Chann-Pay plateau, Sam-zi-yan, 1600 m alt., 25-28. VIII. 1971 (leg. Papp & Horvatovich).

## SYSTEMATICAL PART

### Genus *Oecetis* M c L.

This genus is new for the fauna of Korea, with following four species established there:

*Oecetis nigropunctata* U l m e r, 1908 (= *Oecetis pallidipunctata* M a r t y n o v, 1935 **syn. nov.**)

Localities and material studied: 1a — 1♂, 8♀; 8a — 2♀; 8b — 2♂, 5♀; 9c — 2♂, 2♀; 18c — 2♀; 18f — 2♀; 18h — 2♂; 18i — 1♂, 3♀; 27 — 3♂, 1♀; 28 — 1♀; 29e — 9♂, 5♀; 32 — 1♀.

Describing *Oe. pallidipunctata* M a r t y n o v (1935) has stressed on its resemblance with *Oe. nigropunctata* from Japan. As main distinctive feature the difference in arrangement of forewing anastomose was pointed out: 2nd and 3d cross-vein in one line (*nigropunctata*), or distant (*pallidipunctata*). Further on, the same author (M a r t y n o v, op. cit.) continues: "... There arises the question whether the form of anastomose in *Oe. nigropunctata* is a constant feature, or there are forms transitive to *Oe. pallidipunctata*...". This question could now be answered: the position of these two cross-veins varies; 4♂ and 2♀ out of the series studied now have these veins lined in one, while in the rest of the insects the cross-veins are variously separated. Having also in mind the evident lack of differences in both descriptions of genitalia male, I consider *Oe. pallidipunctata* M a r t. synonymous of *Oe. nigropunctata* U l m.

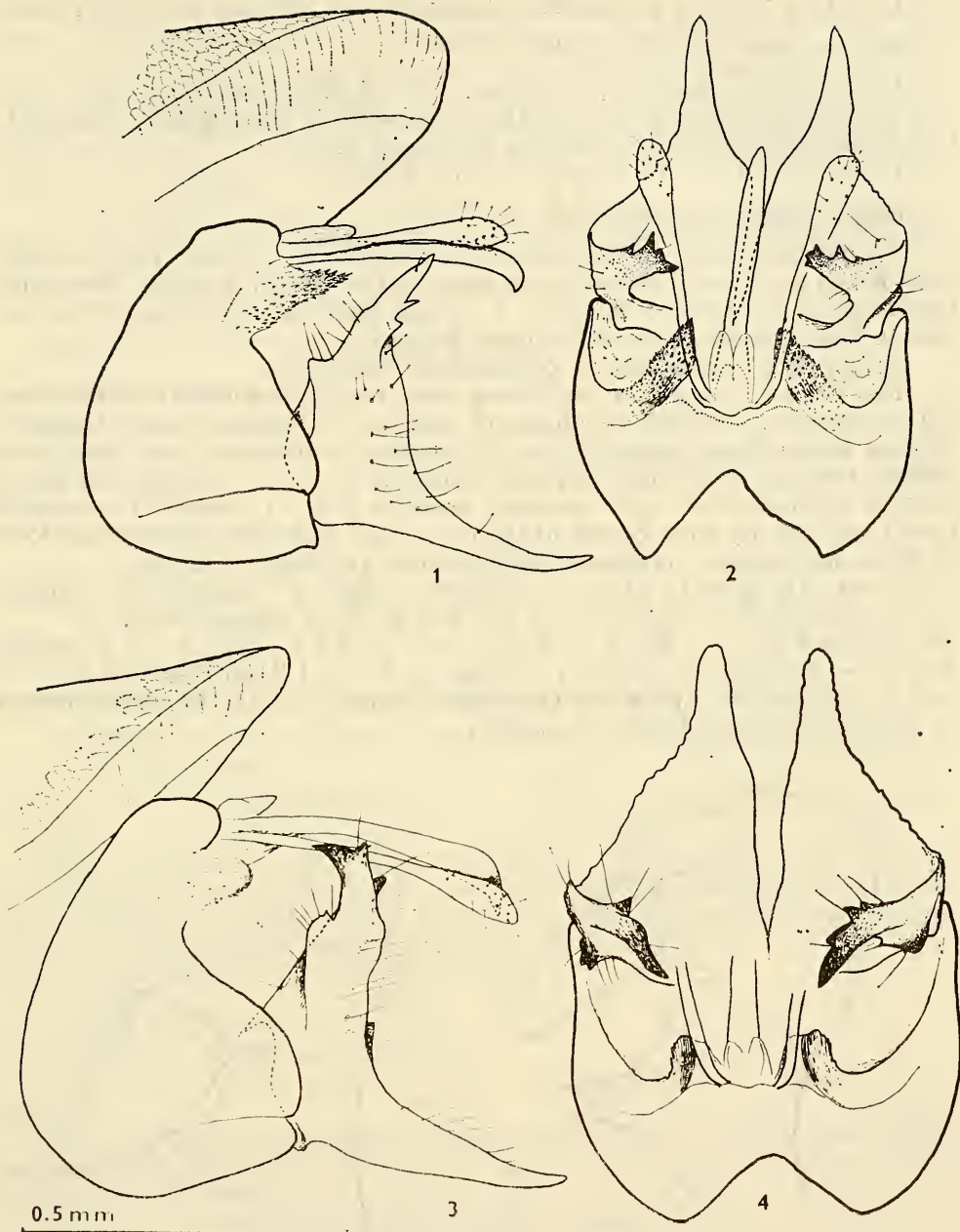


Fig. 1-4. *Oecetis testacea orientalis* ssp. n. and *Oecetis testacea testacea* (Curt.), genitalia male (aedeagus omitted)

*Oe. t. orientalis* ssp. n.: 1 — lateral, 2 — dorsal. *Oe. t. testacea*: 3 — lateral, 4 — dorsal

Distribution: The Far East of the USSR, Japan, and now Korea.

*Oecetis tripunctata* (Fabricius, 1793)

Localities and material studied: 29b — 1♀; 29c — 17♂, 295♀.

Distribution: Palearctic (Europe, East Siberia, and now Korea).

*Oecetis nukii* Tsuda, 1942

Locality and material studied: 29e — 6 ♀.

The determination of these females was based on the peculiar colour pattern of the forewing, fully repeating the one of male.

Distribution: Japan, and now Korea.

*Oecetis testacea orientalis* ssp. n.

Though resembling in appearance the insects from Europe, the specimens from Korea are clearly distinct with some of the genital features. Describing the latter as a separate subspecies, I include here some drawings of the nominate form, taken after insects from Bulgaria.

Colour and dimensions as of nominate subspecies.

Male genitalia: In general after the typical pattern, with following differences: Distolateral lobes of segment IX forming acute triangles, covered with minute spines (Fig. 1, 2), whereas in nominate form those lobes appear rounded and almost without spines (Fig. 3, 4); dorsal branches of inferior appendages straight, pointing upwards (Fig. 1), whereas in nominate form their tips are more or less distinctly curved orad (Fig. 3); ventral lobes of these appendages, correspondingly, slender (cf. Fig. 2 and 4).

Female genitalia: Distolateral lobes of segment IX elongate and much narrower in lateral view (cf. Fig. 5 and 6, respectively).

Localities and material studied: 9a — 1 ♂ paratype; 9c — holotype ♂, and 6 paratypes ♀; 9f — 1 ♀ paratype; 29b — 1 ♂ and 1 ♀ paratypes. The whole type series deposited in the National Museum of Natural History, Sofia (in alcohol).

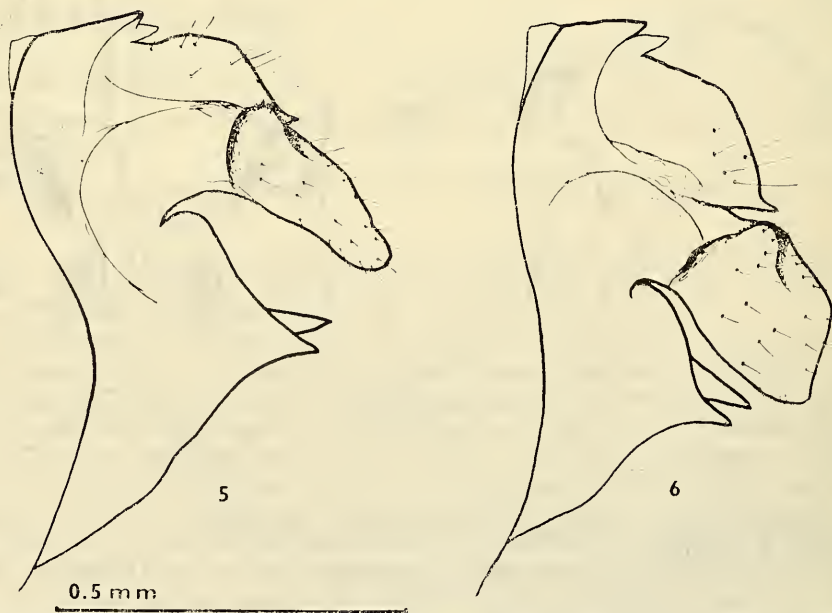


Fig. 5-6. *Oecetis testacea orientalis* ssp. n. (5) and *Oecetis testacea testacea* (Curt.) (6), female genitalia, lateral

**Discussion:** The only information about the presence of this species in the easternmost regions of the Palearctic goes back to Kuwayama (1930), the occurrence of *Oe. testacea* in Japan been evidently not recognized by any other author. On the other hand, this species has not been established out of Europe and it was a sort of surprise to be found in Korea as well. Besides homologically, the two subspecies are readily recognizable after the above mentioned genital features.

**Distribution:** This subspecies — Korea, and most probably, Japan; the species as a whole — Europe and the Eastern part of the Palearctic.

### **Genus *Leptocerus* Leach**

The genus is new to the fauna of Korea.

*Leptocerus valvatus* (Martynov, 1935)

**Locality and material studied:** 15 — 1 ♀.

**Distribution:** The Far East of the USSR (Amur basin), Japan, and now Korea.

### **Genus *Setodes* Ramb.**

*Setodes pulcher* Martynov, 1910

**Localities and material studied:** 9c — 1 ♂; 9f — 1 ♀; 18a — 3 ♂, 1 ♀; 18b — 1 ♂; 29b — 102 ♂, 77 ♀; 29c — 184 ♂, 29 ♀; 29e — 148 ♂, ca 7000 ♀.

**Distribution:** The USSR (Siberia and the Far East), Korea.

*Setodes argentatus* Matsumura, 1906 (= *S. appendiculatus* Martynov, 1933 **syn. nov.**)

**Localities and material studied:** 18h — 1 ♀; 29e — 9 ♂, 17 ♀.

The species was reported from Korea once (Tsuchida, 1942). Females now studied are fully corresponding to those of *S. appendiculatus* (described and so far known only after females!), what is the motive of above proposed synonymy. Female genitalia newly presented on Figs 10—12.

**Distribution:** East Palearctic.

*Setodes ujiensis* (Akagi, 1960)

Species new to the fauna of Korea.

**Locality and material studied:** 18c — 1 ♂, 1 ♀ (cf. *ujiensis*).

This species was known after male only (Akagi, 1960). The insects now available are looking quite similar, so I am giving below the description of the probable female.

Very pale coloured, habitually resembling male.

**Female genitalia:** Sternal area of segment IX with a distinctive transversal groove and two surrounding plicas, the frontal one between sternites VIII and IX (Fig. 13). Segment IX chitinized much stronger than previous segments, its tergum and sternum fused. Dorsal plate of segment X elongate, tongue-shaped, its base surrounded by a pair of short superior appendages. Lateral lobes of segment IX shorter than its dorsal plate, each one high, subdivided by an oblique groove into dorsal and ventral portions; dorsal portion

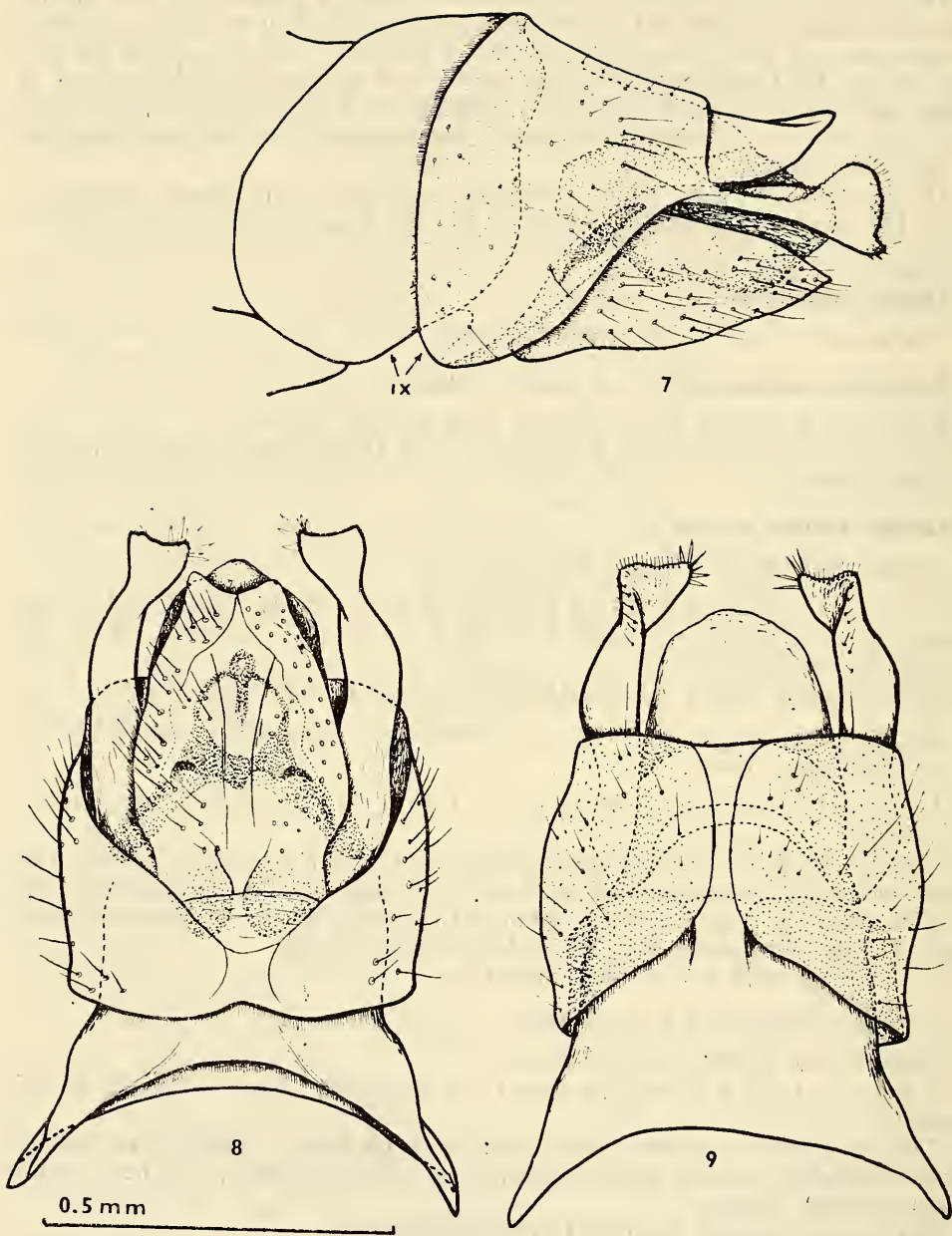


Fig. 7-9. *Setodes crossotus* Mart., genitalia female: 7 — lateral, 8 — ventral, 9 — dorsal

appears as finely fringed, flat vertical plates, ventral portion with a setose internal bulge (Fig. 14). Viewed ventrally, genitalia covered by a distinct subtrapezoidal plate (gonopod plates?).

Distribution: Japan (Honshu), and now Korea.

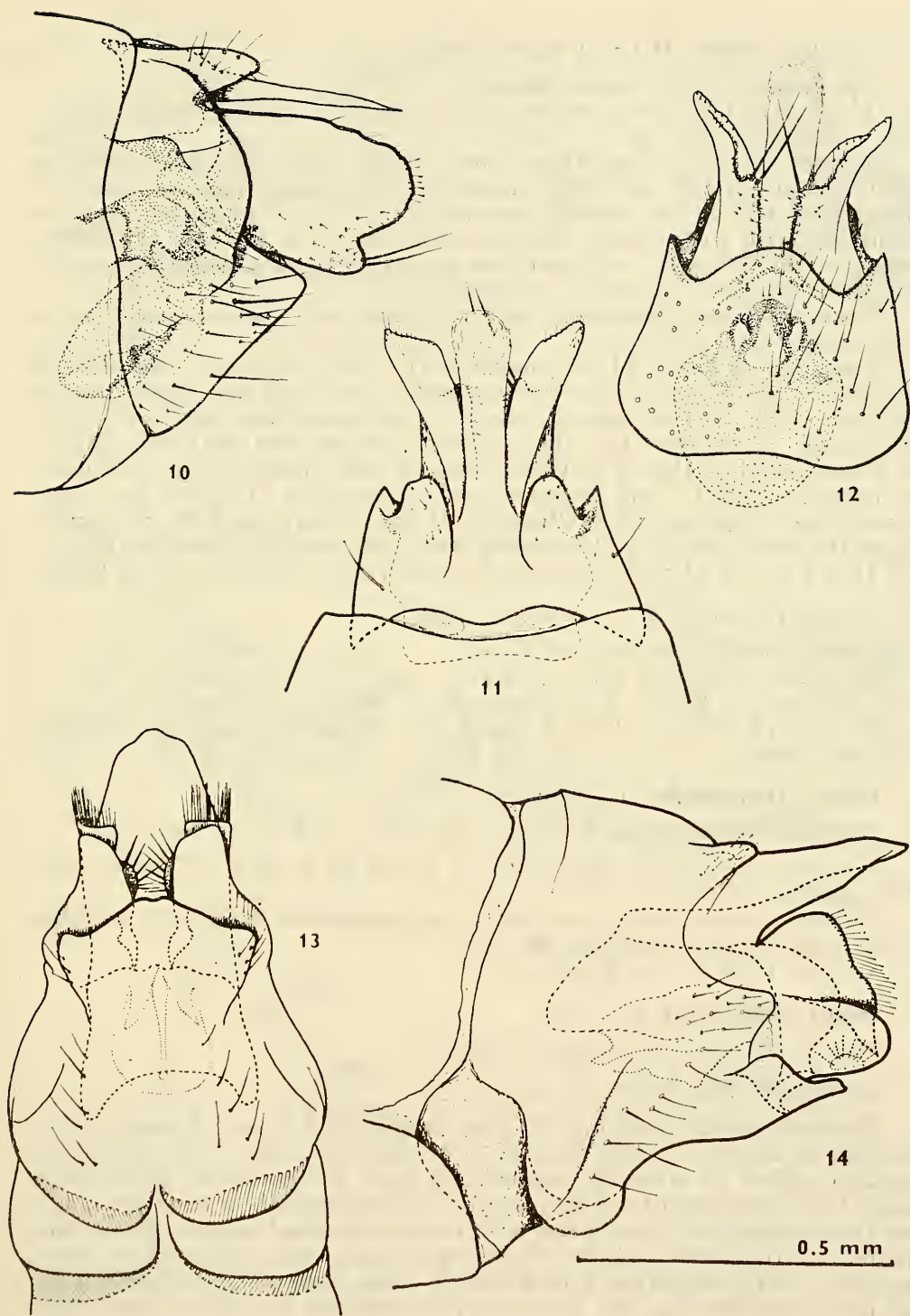


Fig. 10-14. *Setodes argentatus* Mats. and *Setodes ujiensis* (Akagi), female genitalia  
*S. argentatus*: 10 — lateral, 11 — dorsal, 12 — ventral. *S. ujiensis*: 13 — ventral, 14 — lateral

*Setodes crossotus* Martynov, 1935

Species new to the fauna of Korea.

Localities and material studied: 29 c — 1 ♂, 3 ♀; 29 e — 60 ♂, ca. 1050 ♀.

Besides the description (taken after a single male) there are almost no other data about this very distinct species. The females now available are strongly resembling the general appearance of males. Further on, they are clearly different from all the *Setodes*-females known so far from the eastern regions of the Palearctic, so I give here a short description, although association with male not absolutely certain.

Very pale insects, generally well corresponding with males both in colour pattern and dimensions.

Female genitalia: Segment IX well chitinized and heavily modified; its main part divided in two portions, proximal one drawn into the distal one (Fig. 7). Two long and slender laterocaudal lobes arising from distal margin of segment IX; their apices truncate and enlarged (Fig. 7-9). Ventrocaudal portion of genitalia forming a pilose plate, triangular if viewed laterally (Fig. 7), and trapezoidal from beneath (Fig. 8). Above that plate (sternal part of segment IX ?) situated both the membranous body of segment X and the dorsal plate (equal in length); the latter broad and rounded (Fig. 9).

Distribution: The Soviet Far East (Ussuri basin), and now Korea.

*Setodes furcatulus* Martynov, 1935

Species new to the fauna of Korea.

Localities and material studied: 9 c — 1 ♂; 18 e — 1 ♂; 29 b — 1 ♀; 29 c — 1 ♀; 29 e — 40 ♂, 100 ♀.

Distribution: The Far East of the USSR (Amur and Ussuri basins), and now Korea.

**Genus *Trichosetodes* Ulm.**

*Trichosetodes polonorum* Botosaneanu, 1970

Locality and material studied: 29 e — 7 ♂, 6 ♀ (cf. this species).

This species was known only after the single male (holotype), collected in the same region as our Loc. 29.

Distribution: Korea.

**Genus *Athripsodes* Billb.**

New to the caddisfly fauna of Korea.

*Athripsodes ceracleoides* sp. n.

Forewing length male 8,8-9,2 mm, female 8,0-8,4 mm. Antennae very long, up to 22 mm in male. General colouration uniform, rusty yellowish; antennae yellow to brownish, segments of basal 1/3 annulated basally with white. Fifth and almost the whole length of fourth segments of maxillary palps and third segment of labial palps with reduced, mottled sclerotization. Mid-cranial sulcus of vertex absent. Forewing elongate and narrow, their apices relatively acute; membrane with brownish, dense pubescence; venation without particularities (Fig. 15). Spurs 2, 2, 2. Abdomen whitish, its terga somewhat darkened.

Male genitalia: Tergal and sternal part of segment IX partially separated by long membranous wedges (Fig. 16). Dorsomedian portion of seg-

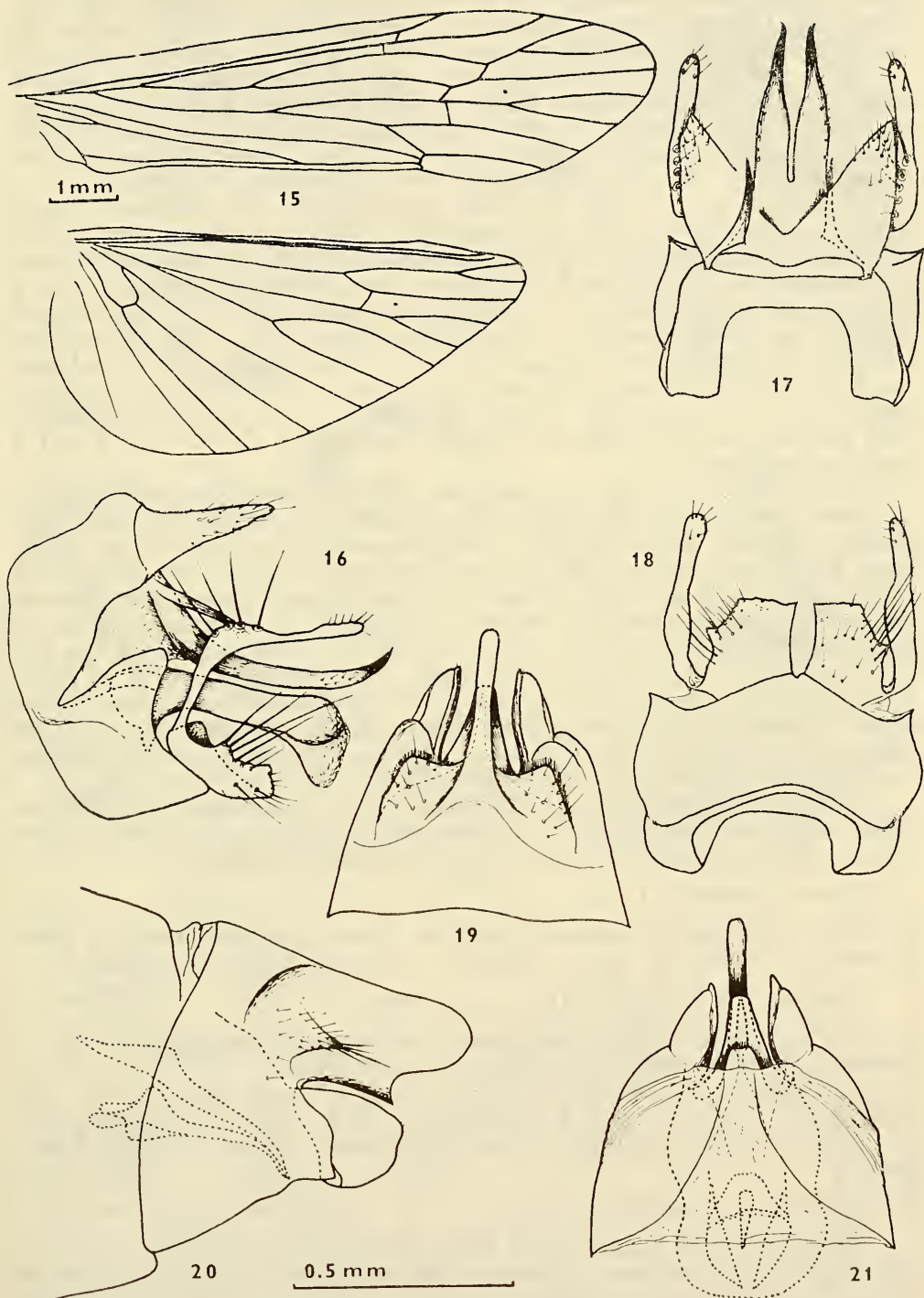


Fig. 15-21. *Athripsodes ceracleoides* sp. n., wings and genitalia. Male: 15 — venation of wings, 16 — genitalia, lateral, 17 — the same (aedeagus omitted), dorsal, 18 — the same, ventral; Female: 19 — genitalia, dorsal, 20 — the same, lateral, 21 — the same, ventral

ment IX very short, ventromedial portion longer. Superior appendages long, triangular, laterally narrow. Segment X deeply divided in two tapered, in lateral view slender and regularly up-curved, lobes (Fig. 16); each lobe with one long, thorn-like basolateral process. Inferior appendages with massive basal part and long and slender dorsal process; basal parts broad and angulate ventrally (Fig. 18), each with several long setae; dorsal processes much longer, slightly dilated and bent at midlength, with 4-5 very strong setae each. Aedeagus a simple tube, its apex semimembranous and dilated ventrally.

**Female genitalia:** Ninth sternum with two chitinous lateral plates, separated by membranous area (Fig. 21). Ninth tergum short, fused with the sternal sclerites. Ventrolateral lobes of segment IX small and thickened, rounded in lateral view. A pair of very short, setose processes surrounding base of segment X. Segment X characteristically shaped — long, strongly flattened, projected caudally, in dorsal view appearing as a long, narrow keel (Fig. 19). Processus spermathecae massive, on Figs 20 and 21 oversimplified.

**Localities and material studied:** 18 a — 1 ♀ paratype; 18 c — 3 ♂ paratypes; 18 h — holotype ♂, 17 ♂ and 42 ♀ paratypes (1 ♂ and 1 ♀ in coll. John Morse, Clemson University, S. C., USA); 18 k — 1 ♂ and 2 ♀ paratypes.\*

**Discussion:** After the genital pattern the new species is close to *A. tsudai*, described from Japan (Akagi, 1960). Some of its nongenitalic features, however, are typical for a *Ceraclea* species rather than for an *Athripsodes*. Such, above all, are the absence of midcranial sulcus and the reduced sclerotization both of the two terminal segments of maxillary palps. Unfortunately, these features are not noted in the description of *A. tsudai*, so it cannot be decided whether the above mentioned peculiarities are typical for the species from Korea only, or they are of group level. Meanwhile, Prof. J. Morse has kindly informed me (in litt.) that lack of midcranial sulcus could be observed in some other representatives of genus *Athripsodes* also. It seems, however, that *A. ceracleoides* sp. n. (and, possibly *A. tsudai*) could be regarded as an intermediate step between the two above named related genera.

Besides the combination of male genitalia of *Athripsodes* type, with the other features of *Ceraclea* type in the new species, other distinguishing features are also the uniquely structured details in female genitalia.

### Genus *Ceraclea* Steph.

This is the largest leptocerid genus in Korea, presented there by series of species from its two main subgenera — *Ceraclea* and *Athripsodina*.

#### *Ceraclea* (C.) *alboguttata* (Hagen, 1860)

One male specimen has been already announced from Korea (as *A. biwaensis* Ts. & Kuw.) by Botosaneanu (1970).

**Localities and material studied:** 18 a — 1 ♂, 3 ♀; 18 b — 1 ♀; 18 c — 1 ♂; 18 e — 5 ♂, 4 ♀; 18 h — 2 ♂; 29 c — 1 ♂, 2 ♀.

**Distribution:** The Palearctic (Europe, northern China, Korea, Japan).

#### *Ceraclea* (C.) *morsei* sp. n.

Forewing length male 8,2-10,0 mm; female smaller, forewing length 7,5 mm. Definitive colouration brown to darkbrown (though most of specimens studied freshly emerged, respectively paler). Wings brown, densely pubescent;

\* This species has just been found also in China (Dr. Yang Lianfang, in litt.)

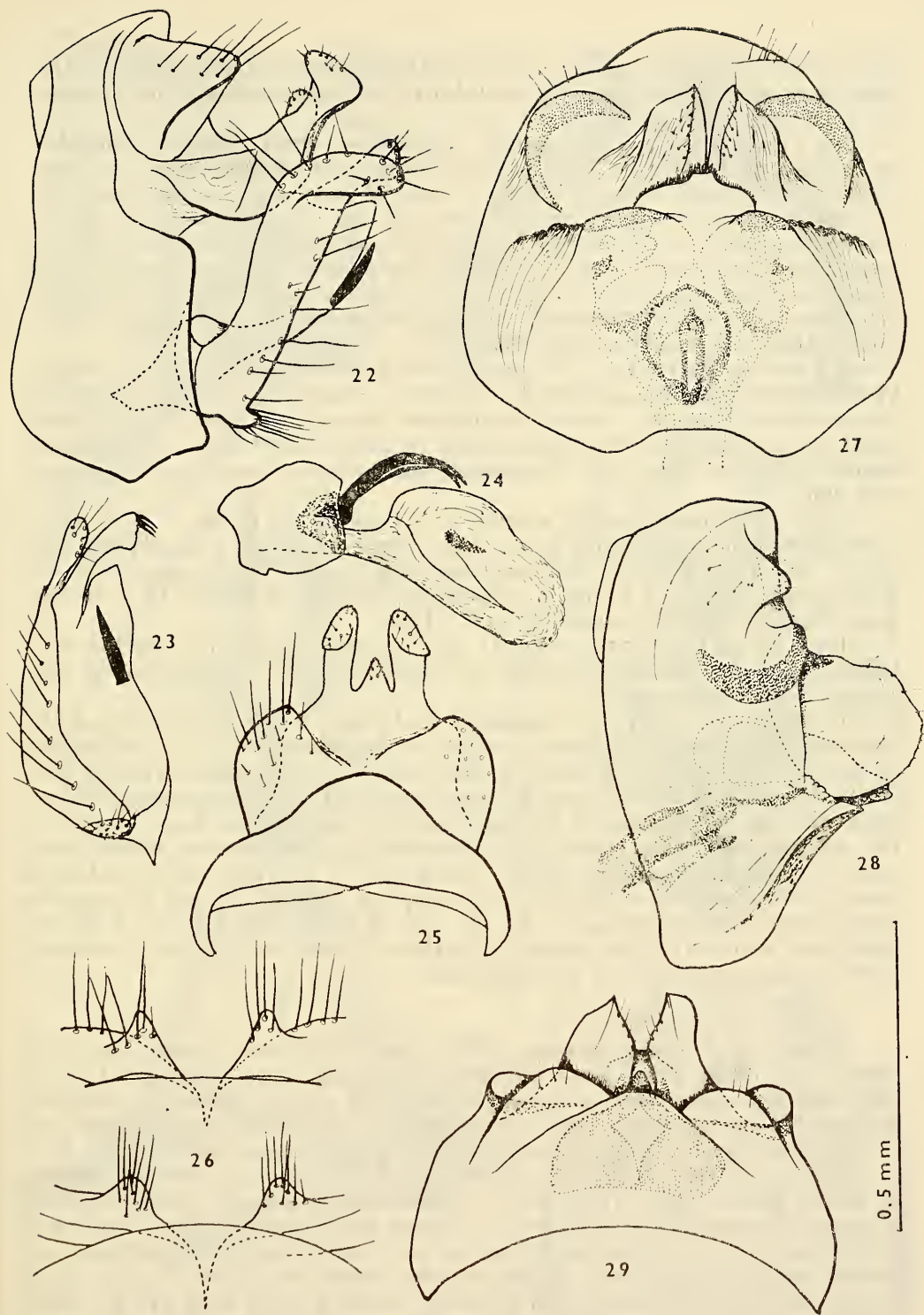


Fig. 22-29. *Ceraclea (C.) morsei* sp. n., genitalia

M a l e: 22 — lateral (aedeagus omitted), 23 — left inferior appendage, caudal, 24 — aedeagus, lateral, 25 — segments IX and X, dorsal, 26 — shape of the baso-ventral lobe of coxopodite in two different specimens, ventral; F e m a l e: 27 — ventrocaudal, 28 — lateral, 29 — dorsal

palps, thorax and legs smoky brown; center of face with white setae, other setae on head and thorax mainly black-brown. Abdomen whitish, with smoky brownish tergia. Spurs 2, 2, 2.

**Male genitalia:** Superior appendages short, nearly triangular. Tergal part of segment IX short, with a broadly rounded distomedial convexity. Segment X divided apically into a pair of large and capitate lateral lobes, and a small, triangular median lobe (Fig. 25). Basoventral lobe of each coxopodite feebly developed, in form of more or less rounded bulge bearing several usual setae only (Fig. 24). Mesal ridge of each inferior appendage with a very long and strong spine, clearly visible also in side view (Fig. 22). Subapico-dorsal lobe of the coxopodite bent caudad, as long as the harpago. Phallobase without long ventral lobe (Fig. 26).

**Female genitalia:** Dorsolateral lobes of segment IX very short. Ventrolateral lobes of segment IX moderate, rounded, with their external surface striate; there is an internal sclerotized plate on the level of their dorso-basal corners; each internal plate broad in dorsoventral view, and comma-shaped laterally (Fig. 27). Processus spermathecae complicately formed (Fig. 28).

**Localities and material studied:** 18 b — 1 ♂ paratype; 18 c — holotype ♂, 5 ♂ and 1 ♀ paratypes; 18 d — 2 ♀ paratypes; 18 e — 1 ♂ paratype; 18 f — 3 ♂ paratypes; 18 h — 2 ♂ paratypes; 18 i — 5 ♀ paratypes; 29 c — 1 ♂ and 1 ♀ paratypes. One ♂ from Loc. 18 c in coll. John Morse, Clemson University, S. C., USA.

**Derivation nominis:** It is a pleasure for me to name this new species after the eminent specialist on Trichoptera and Leptoceridae in particular, Prof. John Morse.

**Discussion:** *C. (C.) morsei* sp. n. belongs to the *Fulva* group of the nominate subgenus. It is closely related to the European *C. (C.) albimacula* (Ramb.) and also, to a certain extent, to *C. (C.) transversa* (Hag.) from North America, as well as to the Palearctic species *C. (C.) alboguttata* (Hag.). From *albimacula* it could be distinguished by the different shape of tergum IX and segment X and, above all, by the much stronger spine on the mesal ridge of coxopodite (clearly visible, with a part of the ridge itself, in lateral view); from *transversa* — by the dorsal shape of segment IX and its superior appendages; from *alboguttata* — by the lack of long ventral lobes of the coxopodites, with only a few, normal setae there, as well as by its much stronger spine on the mesal ridge of the coxopodite.

*Ceraclea (C.?) gigantea* sp. n.

A very large insect: forewing length female, 15 mm. Colouration in alcohol dark. Head, nota, meso- and metapleura and coxae black; palpi, antennae and legs darkbrown; wings brownish, with dark and dense pubescence; abdominal sclerites smoky brownish. Forewing tip rather acute; stigma and radial vein intensive dark, other veins also distinct. Spur formula 2, 2, 2.

**Female genitalia:** Dorso-caudal margin of segment IX formed at a very obtuse angle. Tergal zone of segment X as a short, laterally acute, triangle; between it and tergum IX a broad membranous region, bearing a pair of very flat, membranous pyramidal processes (superior appendages), and another pair of small, dark sclerites situated below pyramides (Fig. 30). Ventrolateral lobes of segment IX ("lamellae", after Yang & Morse, 1988) nearly quadrangular in side view (Fig. 30), strongly concave externally. Gonopod plates striate, closely approximate anteriorly, diverged posteriorly

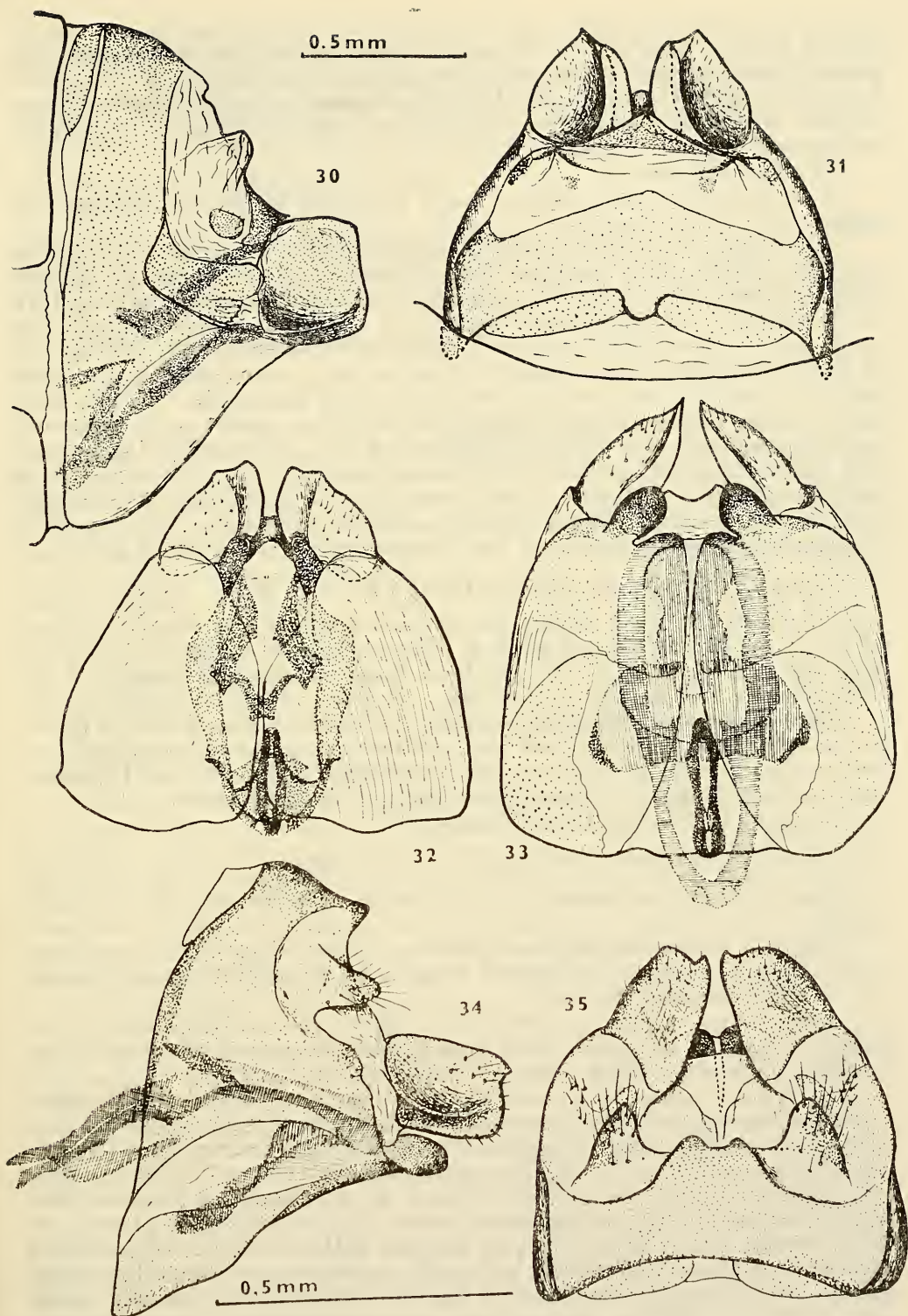


Fig. 30-35. *Ceraclea (C.?) gigantea* sp. n. and *Ceraclea (Athripsodina) sibirica* (Ulm.), female genitalia  
*C. (C.?) gigantea* sp. n.: 30 — lateral, 31 — dorsal, 32 — ventral. *C. (A.) sibirica*: 33 — ventral, 34 — lateral, 35 — dorsal

beyond middle, each plate with one elongate, rounded projection caudally; a short, tongue-shaped membranous lobe between projections (Fig. 31). Spermathecal sclerite U-shaped, with long lateral arms; supporting bands shorter, situated above the lateral arms, with their oral ends connected by a small lyroid-shaped sclerite (Fig. 31).

Male: unknown.

Locality and material studied: 29 a — holotype female.

Discussion: Although with unknown male, this female differs so much from all the other species of *Ceraclea* that I find it reasonable enough to be described rather than left unnamed. One of the main characteristics here is the unusually big dimensions. Bearing in mind that females in genus *Ceraclea* (and in many other leptocerid genera as well) are usually smaller and at least not bigger than corresponding males, the unknown male of *C. gigantea* sp. n. should be expected to be not smaller than the female, i. e. with forewing length not less than 15 mm. The only other species with somewhat similar dimension seem to be *C. (C.) fulva* Ramb., occurring in the western part of the Palearctic, and *C. (Athripsodina) major* (Hwang), known from the Oriental region of SE China. Female genitalia of *C. gigantea* sp. n., although following the common pattern, have also distinctive features. Unless male is described, subgeneric position of this species should be considered tentative.

*Ceraclea (Athripsodina) lobulata* (Martynov, 1935)

Localities and material studied: 18 a — 6 ♂, 10 ♀; 18 b — 1 ♂, 10 ♀; 18 c — 7 ♂, 3 ♀; 18 e — 32 ♂, 20 ♀; 18 f — 1 ♂, 1 ♀; 18 h — 6 ♂, 4 ♀ (a couple in coll. John Morse, Clemson University, S. C. USA); 18 k — 2 ♂, 2 ♀; 26 — 1 ♂; 29 c — 3 ♂, 2 ♀; 29 e — 1 ♂.

This is one of most common representatives of Leptoceridae in Korea. One unnoted so far morphological feature of this species is worth mentioning — the presence of midcranial sulcus (better developed in females than in males), otherwise not typical for *Ceraclea* species, but for *Athripsodes*.

Distribution: East Palearctic.

*Ceraclea (Athripsodina) sibirica* (Ulmer, 1906)

Locality and material studied: 29 c — 6 ♂, 18 ♀; 29 e — 4 ♂.

Although female are deposited and 1 ♀ is even designated as paralectotype (Morse, 1975), actually this member of *Annulicornis* group was, in fact, known only after the male.

Description of female: Habitually resembling males, but somewhat smaller; forewing length 7.5-8.0 mm (correspondingly 9.0-9.2 mm in male). Midcranial sulcus present in both males and females.

Female genitalia: Generally strongly chitinized, much darker than previous segments of abdomen. Distomedial portion of tergum IX caudally slightly bifid. Superior appendages conspicuous. Lateral lobes ("lamellae" in Yang & Morse (1988)) sloping dorsally, longer than high, angulate (Fig. 33). Sternal side of genitalia (i. e. gonopod plates of sternites VIII and IX) broad and flat; each gonopod plate of two portions, separated by striate membrane — oral portion (i. e. sternum VIII) with dark lateral sclerite, and caudal portion, terminating with a big caudal lobe and a smaller, blunt medial lobe (Fig. 34). Spermathecal sclerite with strongly elongate lateral arms, ventrally elliptical, of two parts — elongate-elliptical dorsal one, and

nearly half as long ventral one; ventral part consisting of narrow caudal arms and suddenly broadened oral half.

**Distribution:** East Palearctic (Eastern Siberia and Korea; very probable also in the northeastern regions of China).

*Ceraclea (Athripsodina) excisa* (Morton, 1904)

Species new to the fauna of Korea.

**Locality and material studied:** 18 b — 1 ♀.

Another member of the group of *Annulicornis*. River Tedong near Phyongyang is the southernmost locality of this otherwise northern species.

**Distribution:** North Palearctic and N-W of the Nearctic regions, including Northeastern China and now Korea.

*Ceraclea (Athripsodina) shuotsuensis* (Tsuchida, 1942)

**Localities and material studied:** 29 b — 3 ♂, 10 ♀; 29 c — 1 ♂, 1 ♀; 29 e — 7 ♂.

This member of the *Annulicornis* group has been described from Northern Korea and considered endemic there. Recently Yang & Morse (1988) established that *C. bicalcarata* Schmidt (described from Mongolia) is synonymous with *shuotsuensis*. Further on, these authors give an interpretation of Botosaneanu (1970) suggesting that instead of *C. sibirica* he had in fact examined material of *C. shuotsuensis*. Having now sufficient material of both *sibirica* and *shuotsuensis* (clearly different and, moreover, collected simultaneously — Loc. 29 c) I think it was exactly *C. sibirica* what Botosaneanu (op. cit.) had examined. The suggestion of the latter author about a probable synonymy between *sibirica* and *shuotsuensis* (Botosaneanu, op. cit.) should be rejected. Females in our material correspond well, although not absolutely, to the figures in Yang & Morse (1988).

**Distribution:** East Palearctic (Mongolia, NE China, Korea).

*Ceraclea (Athripsodina) armata* sp. n.

Variable in dimension, generally middle-sized insects; forewing male 8,0-9,5 mm, female 7,5-8,5 mm in length. Head of the typical for genus *Ceraclea* shape, without midcranial sulcus. Antennae very long, up to 21 mm long in males. Colour (in alcohol) uniformly brown. Head, scapes, palps and thoracic sclerites (including pleura and coxae) darkbrown to black; flagellums of antennae, legs and abdominal sclerites smoky brownish. Head and prothoracic warts with mixed whitish and darkbrown setae. Forewing membrane intensively brown, with only a few small, irregularly spread little spots; venation and pubescence darker. Hindwings pale brownish. Spurs 2, 2, 2.

**Genitalia male:** Segment IX with very short dorsal portion and longer ventral one. Superior appendages deeply separated, with their lateral margins obtuse (Fig. 37). Tenth tergum with blunt apex in dorsal aspect, in lateral view strongly upturned, so that its dorsal margin deeply saddle shaped (Fig. 36); basolateral processes slightly upturned, nearly extending the caudal margin of tergum. Baso-ventral lobe of each inferior appendage short and stout, armed with very big and strongly chitinized spines; each spine usually composed of two, exceptionally — of three (as shown on Fig. 36) equally long, closely pressed (but not merged) spines. Dorsal branch of each inferior appendage slender, sinuous, curved caudad; harpago conspicuously shorter than subapico-dorsal lobe; mesal ridge almost in conspicuous except for a few setae. Phallobase swollen anteriorly; apical portion bearing only one long, diagonally situated if viewed from behind, paramere spine (Fig. 40).

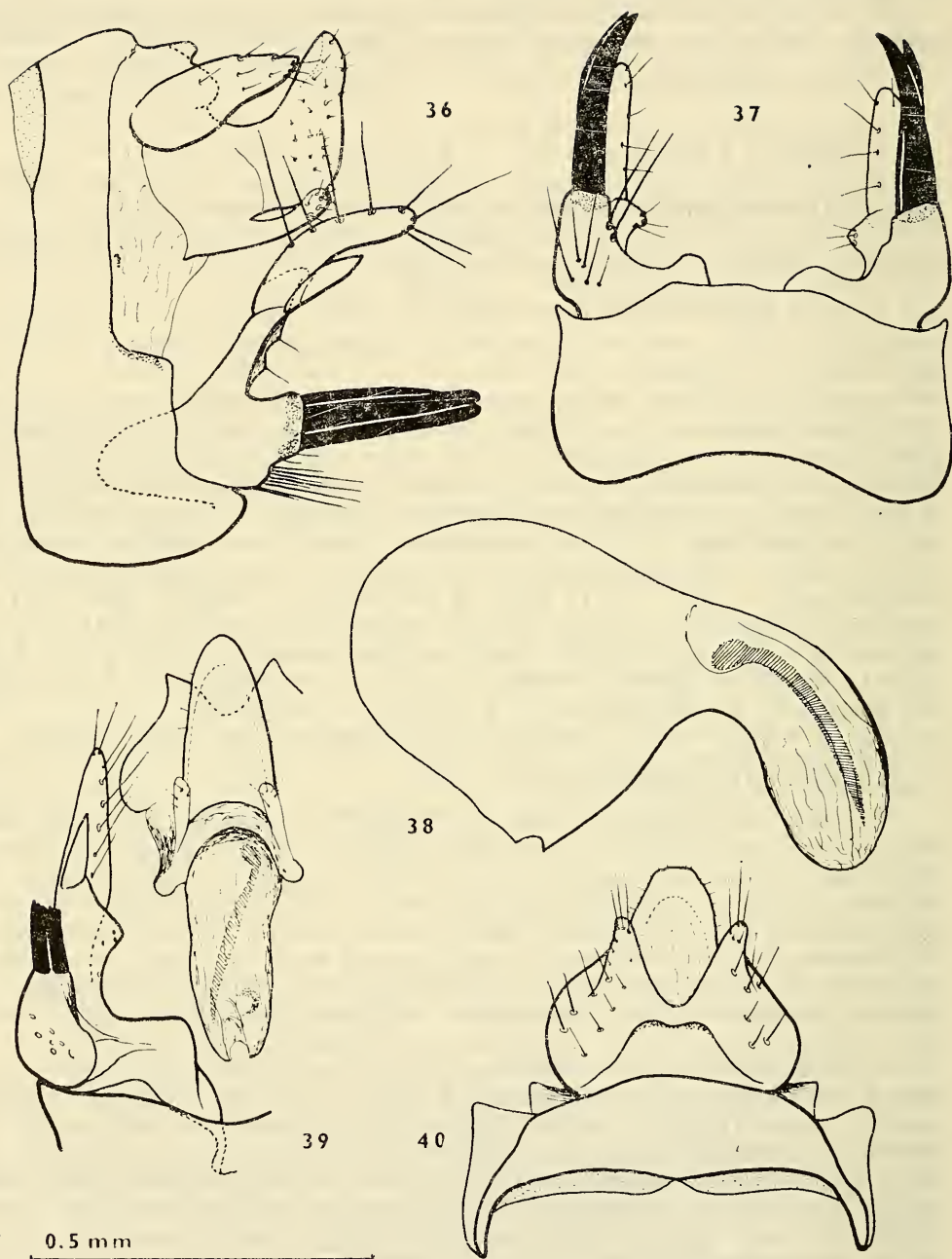


Fig. 36-40. *Ceraclea (Athripsodina) armata* sp. n., genitalia male: 36 — lateral (aedeagus omitted), 37 — segment IX and inferior appendages, ventral, 38 — aedeagus, lateral, 39 — aedeagus and left inferior appendage (partly), caudal, 40 — segments IX and X, dorsal

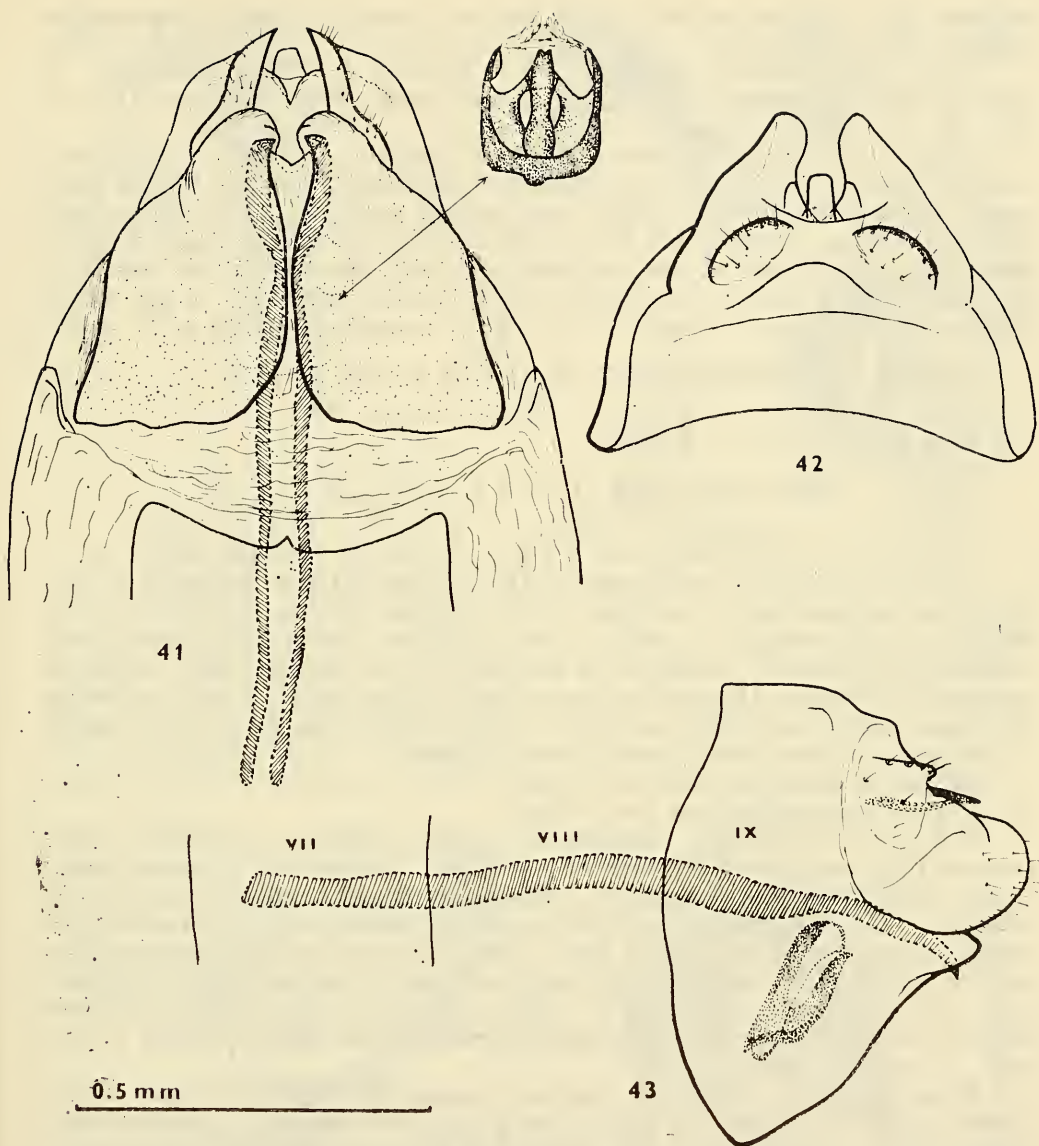


Fig. 41-43. *Ceraclea (Athripsodina) armata* sp. n., genitalia female: 41 — ventral, spermathecal sclerite presented separately, 42 — dorsal (supporting bands of spermathecal sclerite omitted), 43 — lateral

**Female genitalia:** Segment IX with very shallow pleural concavities. Superior appendages very short. Tergal part of segment X, a short, tongue-like process between ventrolateral lobes (lamellae) of segment IX (Fig. 43), in lateral view appearing as a dark, acute process above the lamellae (Fig. 41). Viewed laterally, the lamellae rounded. Gonopod plates subtriangular, approximate along most part of their mesal margins. Spermathecal sclerite U-shaped, shortened; its mesal process as long as lateral arms; supporting bands conspicuous — very long and slender, extending anteriorly to the middle of

segment VII, close and parallel except for their caudal 1/6, where they diverge slightly (Fig. 42).

**Locality and material studied:** 29 a — holotype ♂, 28 ♂ and 88 ♀ paratypes (1 ♂ and 1 ♀ in coll. John Morse, Clemson University, S. C., USA).

**Discussion:** The male of *C. (A.) armata* sp. n. differ from corresponding males of all the other members of *Annulicornis* group by the deep saddle shape of tergum X, with its apex almost vertically upturned, as well as by the strong, paired spines arming the latero-ventral lobe of each inferior appendage. The female of the new species is with the supporting bands of the spermathecal sclerite extending anterad further than ones in any other *Ceraclea*-species (except, maybe, for *C. (A.) annulicornis* (Steph.) only).

*Ceraclea (Athripsodina) hastata* (Botosaneanu, 1970)

**Locality and material studied:** 29 e — 8 ♂.

**Distribution:** Korea.

*Ceraclea (Athripsodina) mitis* (Tsuba, 1942)

Species new to the fauna of Korea.

**Locality and material studied:** 29 a — 120 ♂, 131 ♀.

This leptocerid was discovered in Japan (Honshu) and I could not find any other information in addition to the description. The latter (Tsuba, 1942 b) is good enough for a certain determination after males, although not sufficiently detailed as concerns the genitalia. As to females, they remained practically unknown though mentioned within type series. I am now using the chance of filling in these gaps and to publish newly made genitalia figures of both sexes of this rather poorly known species.

Length of forewing male 7.0-7.5 mm, female — 5.5-6.0 mm (6.5 mm in the original description, sex not stated).

**Male genitalia:** Tergum X slender, upturned, in lateral view capitate (Fig. 44), caudally projected a little bit further than superior appendages; viewed from above segment X broadly triangular, with its apex nearly acute (Fig. 45). Harpago only a little bit shorter than subapico-dorsal lobe of inferior appendages; mesal ridge there with distinctive medial excision (Fig. 46). Phallobase short, anterior end somewhat broader than posterior end; posterior end recurved basally and, if viewed caudally, to the left (Fig. 48); two unequal paramere spines, the shorter one partly fused (basally) with a very dark, sclerotized area.

**Female genitalia:** Superior appendages broad but very short. Caudal margin of tergum IX dorsally as a long, sharp point, connected with segment X by a membranous area. Segment X projected both orad and caudad, tongue-shaped from above, and as a thin, dark lamella laterally (Fig. 49). Ventrolateral lobes of segment IX (lamellae) subovoid; lower pleural region with shallow concavity, terminating on anterior edge of segment. Gonopod plates flat, broadly separated by medial membrane as far as the middle, then converging caudally; each plate with a broader lateral sclerotized area, mediad with a parallel, narrow but conspicuous, dark strip (Fig. 50) and with a single caudal projection. Spermathecal sclerite deeply in baso-oral part of segment IX.

**Discussion:** Although the genitalia of male somewhat resemble the *Annulicornis*-group pattern, *C. (A.) mitis* could hardly be placed there — superior appendages are long, ventral lobes of inferior appendages very short, left paramere spine almost unreduced, etc. Female genitalia as a whole consi-

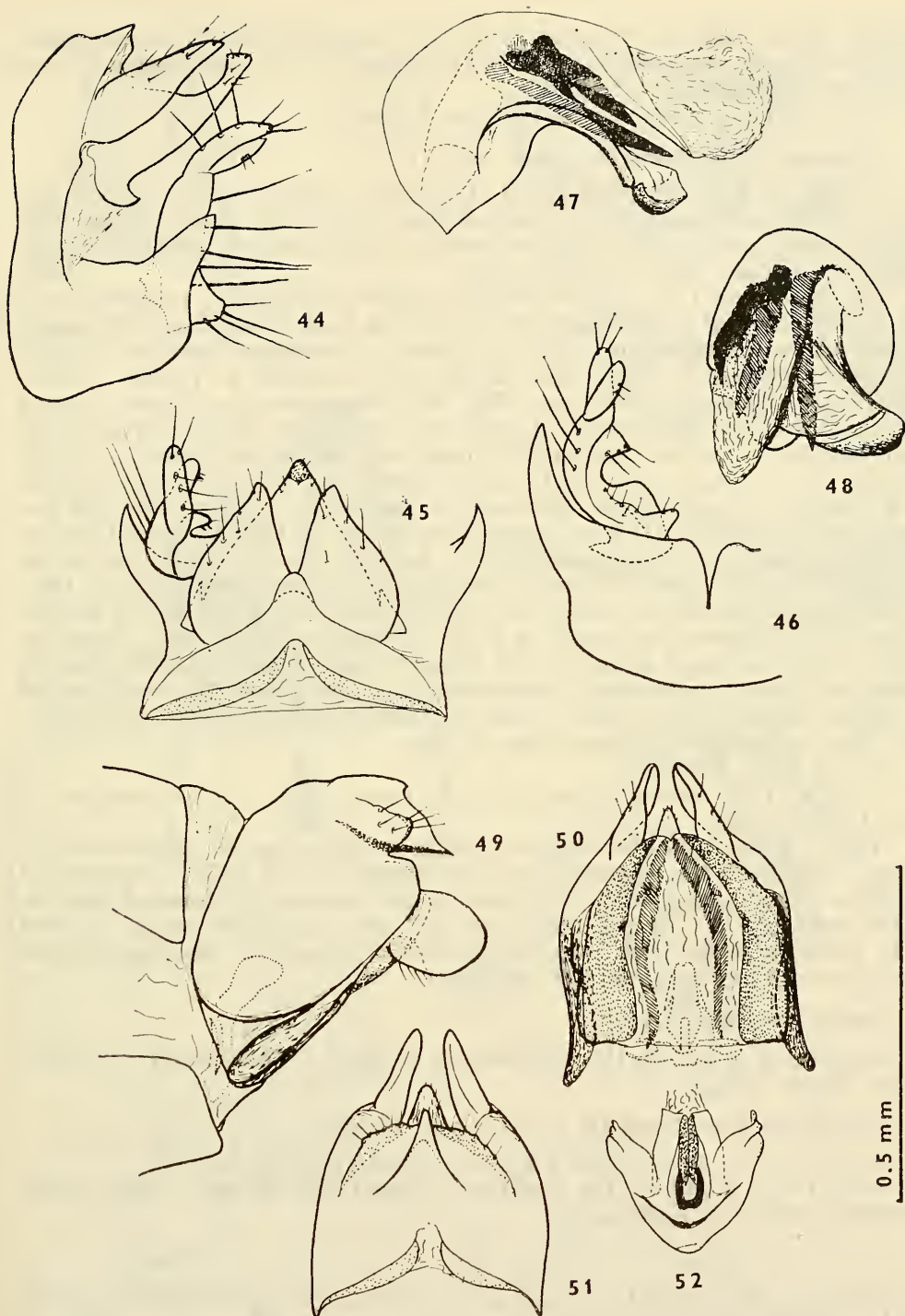


Fig. 44-52. *Ceraclea (Athripsodina) milis* (T s u d a), genitalia. M a l e: 44 — lateral (aedeagus omitted), 45 — dorsal (aedeagus omitted), 46 — segment IX (left half) and left inferior appendage, ventral, 47 — aedeagus, lateral, 48 — the same, caudal; F e m a l e: 49 — lateral, 50 — ventral, 51 — dorsal, 52 — spermathecal sclerite, ventral

derably differ from the *Annulicornis* type — supporting bands of spermathecal sclerite lack; conspicuous shape of the gonopod plates, each one with two chitinous longitudinal strips, etc.

**Distribution:** Japan and now Korea.

*Ceraclea (Athripsodina) coreana* sp. n.

Length of forewing male 7 mm. Uniformly yellowish (in alcohol) species. Vertex and mesonotum yellowish-brown; forewing straw yellow, with yellow-brown pubescence; abdomen whitish, with greyish sclerites; remaining parts of body yellow. Spurs 2, 2, 2.

**Male genitalia:** Distomedial margin of tergum IX projected bluntly caudad. Sternal part of segment IX twice as long as tergal one; its dorso-caudal corners obtuse-angled (Fig. 53). Superior appendages separate for most of their length, rounded in shape, half as long as tergum X. Tergum X slender, tongue-shaped in dorsal view (Fig. 53); lateral processes slender, arising near base and extending almost to the apex of tergum. Baso-ventral lobe of each inferior appendage forming with main body an angle of about  $70^\circ$ , half as long as main body (in lateral view), slightly and obliquely bent ventral, and sharply — mesad. Each baso-ventral lobe with a strong, straight terminal spine, forming with basal part an angle of  $90^\circ$  so that if viewed from beneath these spines directed opposite (Fig. 54). Main body of each inferior appendage sinuous, curved caudad; harpago as long as subapico-dorsal lobe; mesal ridge inconspicuous except for a patch of stiff hairs. Phallobase swollen anteriorly in dorsal view, nearly as broad as posterior apex and, viewed laterally, twice as broad as apical part. Phallic shield U-shaped (Fig. 54), its sclerotized strips conspicuously baso-laterally of phallobase. Two nearly equal in length spines in the phallus — one of them basal, evenly curved dorsally, the other one in the apical part (Fig. 53, 56).

**Female:** unknown.

**Locality and material studied:** 29 c — holotype ♂ and 1 ♂ paratype.

**Discussion:** This species belongs to the group of *Riparia* and is closely related to the Chinese *C. (A.) nankingensis* (Hwang). However, it could be easily recognized by the shape of the baso-ventral lobes of each inferior appendage, which are shorter and still abruptly curved mesad, as well as by the shape of the basal spine of phallus — sinuous in *nankingensis* and evenly curved dorsad in the new species.

**Genus *Triaenodes* McL.**

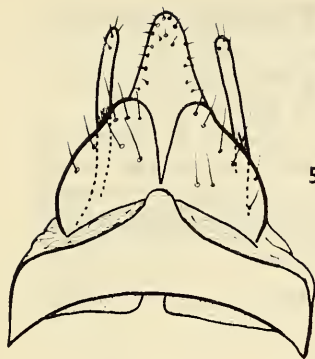
The genus is new to the entomofauna of Korea. Two species have been found there.

*Triaenodes gracillimus* (Martynov, 1935)

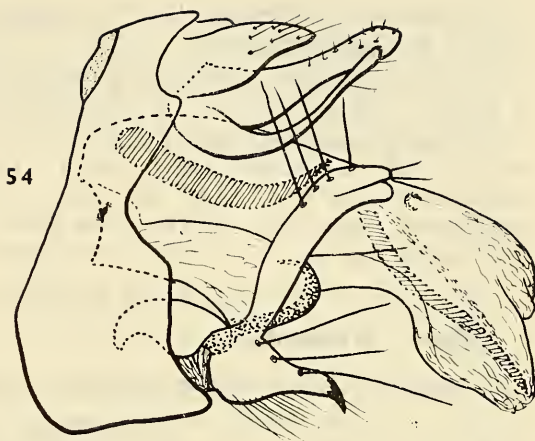
**Locality and material studied:** 9 c — 1 ♂.

**Distribution:** The Far East of the USSR (Ussuri basin), Japan (Honshu) and now Korea.

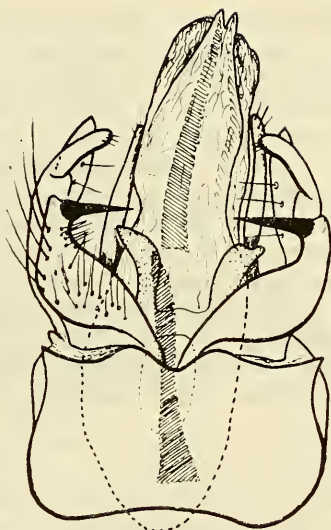
Fig. 53-59. *Ceraclea (Athripsodina) coreana* sp. n., genitalia male and *Triaenodes unanimitis* McL., genitalia female  
*C. (A.) coreana* sp. n.: 53 — segments IX and X, dorsal, 54 — genitalia, lateral, 55 — the same, ventral, 56 — aedeagus, dorsal. *Tr. unanimitis*: 57 — ventral, 58 — lateral, 59 — dorsal



53



54

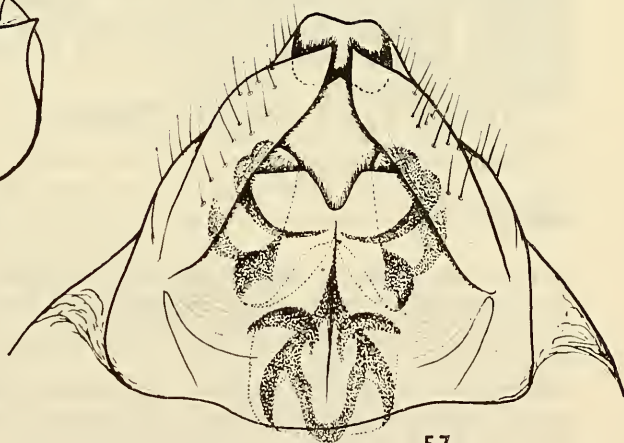


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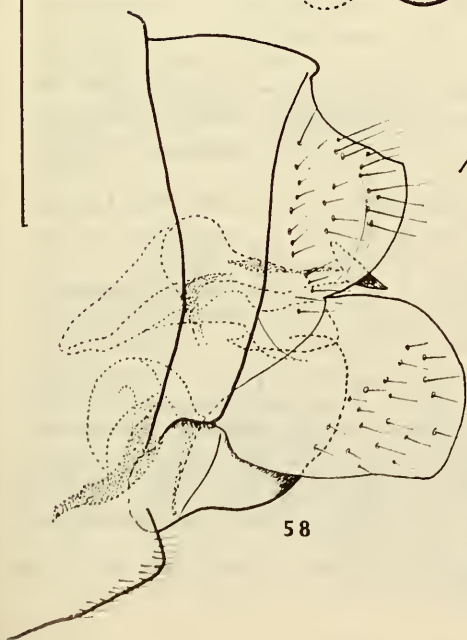


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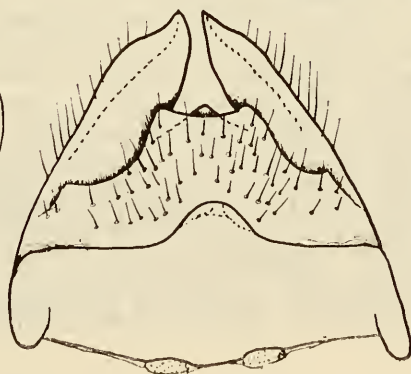
0.5 mm



57



58



59

*Triadenodes unanims* McLachlan, 1877 (= *Triadenodes yamamotoi* Tsuda, 1942) **syn. nov.**

Localities and material studied: 9 a — 1 ♂; 9 c — 1 ♂; 18 a — 1 ♀; 18 h — 1 ♀; 19 a — 1 ♂; 27 — 1 ♂; 29 e — 1 ♀.

Having compared this material with the descriptive texts & figures in McLachlan (1877) and in Martynov (1924; 1935) on the one hand, and in Tsuda (1942 b) on the other, I have come to the suggestion of above mentioned synonymy. At the same time, the female genitalia which remained poorly known so far, are figured here (Fig. 57-59).

Distribution: North Palearctic, including Japan, and now Korea.

### Genus *Mystacides* Berthold

*Mystacides dentata* Martynov, 1924

Localities and material studied: 10 — 9 ♂, 5 ♀; 16 a — 4 ♂, 5 ♀; 16 b — 7 ♂, 16 ♀; 18 a — 1 ♀; 19 c — 1 ♂; 20 a — 1 ♀; 29 b — 2 ♂, 2 ♀; 29 e — 22 ♂, 15 ♀.

First announcement of this species from Korea was made just recently by Mey (1989). However, Botosaneanu (1970) has published from Myohyang Mts. (our Loc. 29) one female as *Mystacides* sp. This specimen, most probably, belongs to *dentata*. Further on, Kim (1974) mentions two different, not specified forms of *Mystacides* from South Korea. This paper, however, is in Korean, and if the illustrated there larva named "*Mystacides* sp. MA" does really belong to that genus could be guessed only after the accompanying figures. As to the second form, i.e. "*Mystacides* sp. KA", what is illustrated is really a *Mystacides*-species (and probably, also *M. dentata*), notwithstanding the evident mistake on Fig. 51 of the paper cited, where female and not male genitalia are presented.

Distribution: East Palearctic.

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## ИССЛЕДОВАНИЯ ФАУНЫ РУЧЕЙНИКОВ (TRICHOPTERA, INSECTA) КОРЕИ. II. СЕМЕЙСТВО LEPTOCERIDAE

Красмир Кумански

(Резюме)

Ручейниковая фауна Корейского полуострова исследована далеко неполно, в чем можно убедиться на примере изученности семейства длинно-антенных, или Leptoceridae. Всего 10 видов из 4 родов было опубликовано до появления настоящей работы, что едва ли превышает 25% всего ожидаемого видового состава.

Определенный нами материал включает 26 видов из 8 родов. Если к этому прибавить еще *Triplectides* sp. и *Ceraclea annulicornis* (St e p h.), опубликованные другими авторами, общее число лептоцеридных таксонов видовой группы, известных в Корее, достигает 9 родов и 28 видов. Вся основная масса, за исключением *Triplectides* sp. (найденный пока лишь в Южной Корее), принадлежит подсемейству Leptocerinae.

Три видовые названия сводятся в синонимы, как следует: *Oecetis nigropunctata* Ulmer, 1908 (= *Oe. pallidipunctata* M a r t y n o v, 1935 syn. n.), *Setodes argentatus* M a t s u m u r a, 1906 (= *S. appendiculatus* M a r t y n o v, 1933 syn. n.) и *Triaenodes unanimitis* M c L a c h l a n, 1877 (= *T. yamamotoi* T s u d a, 1942 syn. n.). Новыми для науки являются подвид *Oecetis testacea orientalis* ssp. n. и виды *Athripsodes ceracleoides* sp. n., *Ceraclea* (C.) *morsei* sp. n., *Ceraclea* (C.?) *gigantea* sp. n., *Ceraclea* (*Athripsodina*) *armata* sp. n. и *Ceraclea* (*Athr.*) *coreana* sp. n. Впервые сообщаются из Кореи также роды *Oecetis*, *Leprocetus*, *Athripsodes* и *Triaenodes*, наряду с видами *Oecetis nigropunctata*, *Oe. tripunctata*, *Oe. yukii*, *Leptocetus valvatus*, *Setodes furcatulus*, *S. crossotus*, *S. argentatus*, *S. ujiensis*, *Ceraclea* (*Athr.*) *excisa*, *C. (Athr.) mitis*, *Triaenodes gracillimus* и *T. unanimitis*. Наконец, дается описание (в т. ч. изображения гениталий) неизвестных или неполным образом описанных полов некоторых редких видов — *Setodes crossotus* (♀), *S. argentatus* (♀), *S. ujiensis* (♀), *Ceraclea* (*Athr.*) *sibirica* (♀), *C. (Athr.) mitis* (♂, ♀) и *Triaenodes unanimitis* (♀).